

## KENDALL WWTF FACT SHEET

GENERAL INFORMATION	
<b>Permit Number:</b> WI-0020516-10	<b>FID:</b> 642006640
<b>Permittee Name and Address (if different from discharge location):</b> Village of Kendall, PO Box 216, Kendall, WI 54638	
<b>Discharge Location:</b> Kendall Wastewater Treatment Plant, 208 E. South Railroad St., Park Rd., Kendall, WI 54639	
<b>Receiving Waters:</b> Baraboo River in the Seymour Creek and Upper Baraboo River Watershed of the Lower Wisconsin River Basin in Monroe County	
<b>Flows:</b>	<u>0.07 MGD Annual Average Design Flow</u> <u>0.047 MGD Actual Annual Average from May-through July 2018</u>
<b>Stream Classification:</b> Coldwater, Non-Public Water Supply	
<b>Q<sub>(7,10)</sub>:</b> 1.8 cfs	
<b>Discharge Type:</b> Continuous	
<b>Permit Application Waivers:</b> None	
<b>Discharge Type:</b> Existing discharge, Continuous	
Sample Point Designation	
<b>Influent Sample No:</b> 701	<b>Sample Description:</b> Representative influent samples shall be collected after the fine screen and prior to entering the plant.
<b>Surface Water Effluent Sample No:</b> 001	<b>Sample Description:</b> Prior to discharge to the Baraboo River, representative composite samples shall be collected in the UV channel before UV disinfection and grab samples shall be collected in the UV channel after UV disinfection.
<b>Land Application Sample No:</b> 002	<b>Sample Description:</b> If sludge is shipped to the City of Elroy WWTF for disposal, representative sludge grab samples shall be collected once per year from the sludge standpipe and monitored for List 1 parameters. Sludge samples shall be collected prior to hauling and test results shall be reported on Form 3400-49 "Waste Characteristics Report". Hauled sludge reports shall be submitted on Form 3400-52 "Other Methods of Disposal or Distribution Report" following each year that sludge is hauled. If sludge will be land applied on Department approved sites instead of hauled to another Department approved storage facility for storage and disposal, monitoring shall include parameters in Lists 1, 2, 3, and 4. PCB monitoring shall occur once in 2020 whether sludge is hauled or land applied.

## FACILITY DESCRIPTION

**Facility Description:** The Kendall Wastewater Treatment Plant upgraded from a conventional package plant with aeration basins, a center clarifier, and aerobic sludge treatment to an extended aeration Aero-Mod Sequox Plus wastewater treatment facility consisting of two parallel treatment trains. The old package plant tank was converted for use as aerated storage for waste sludge generated and a new sludge load-out station was constructed. At the new WWTF, raw wastewater is pumped to the fine screen and screened wastewater flows by gravity to the Aero-Mod into the single influent selector tank with coarse bubble aeration for mixing of the influent wastewater and return activated sludge (RAS). From the selector tank, flow is split between the two aerated treatment trains, each consisting of a first-stage aeration tank, a second-stage aeration tank, a third-stage aeration tank, clarifier, and aerobic digester tank. All tanks except the clarifiers are equipped with coarse bubble diffusers. Aeration duration and frequency is controlled by a DO probe in each of the first-stage aeration tanks. WAS is pumped on a timer from the first-stage aeration tanks to the digesters. Phosphorus can be removed with alum addition to the influent selector tank, although the Village is not currently adding chemical. Effluent is disinfected via UV light prior to discharge to the Baraboo River. The WWTF upgrade also included major improvements to the collection system.

The facility treats domestic waste from the Village of Kendall. The annual average design flow is 0.07 million gallons per day (MGD) and had an actual annual average flow of 0.047 MGD from May through July in 2018. Sludge is hauled to the Elroy WWTF. The reissuance provides language, if the facility chooses to do so, to pursue land application of sludge pending approval of land application sites. Significant changes in effluent monitoring and/or limits in the upcoming permit term are as follows: 1) removal of effluent flow monitoring since flow is now monitored before the influent sample point, 2) lower effluent phosphorus interim limits associated with an approved multi-discharger variance for phosphorus (MDV) and compliance schedules to comply with s. 283.16, Wis. Stats. requirements for phosphorus, 3) addition of weekly geometric mean limit for fecal coliform 4) removal of chlorine monitoring and limits, 5) chloride monitoring in the 4th year of the permit, and 6) reduction of monitoring for copper and ammonia nitrogen to only 4th year of the permit term. In addition, the option of land applying sludge on Department approved sites has been added to the sludge sample point and associated land application sampling parameters.

**Publishing Newspaper:** The Messenger, 229 Main Street, Elroy, WI, 53929 and The County Line, PO Box 7, Ontario, WI 54651

See associated public notice document for additional contact and procedural information.

**Significant Industrial Loading? No**

## SUBSTANTIAL COMPLIANCE DETERMINATION

	Compliance	Comments
<b>Discharge Limits</b>	Yes	
<b>Sampling/testing requirements</b>	Yes	
<b>Groundwater standards</b>	NA	
<b>Reporting requirements</b>	Yes	
<b>Operator at proper grade?</b>	Yes	
<b>Compliance schedules</b>	Yes/	
<b>Other:</b>	NA/	
<b>Enforcement considerations</b>	Yes	The facility undertook a major upgrade for the treatment plant and collection system.
<b>In substantial compliance? Yes</b>	<b>Name:</b> Pete Pfefferkorn <b>Date:</b> September 21, 2018	

## SUBSTANTIAL COMPLIANCE DETERMINATION – LAND APP

	Compliance	Comments
Discharge Limits	Yes	
Sampling/testing requirements	Yes	
Groundwater standards	n/a	
Reporting requirements	Yes	
Compliance schedules	n/a	
Other:	n/a	
Enforcement considerations	None	
In substantial compliance? yes	Name: L. Hinke Date: 09/20/18	

## PROPOSED PERMIT MONITORING AND LIMITATIONS – INFLUENT

Sample Number: 701	Sample Location: Representative influent samples shall be collected after the fine screen and prior to entering the plant.		
PARAMETER	UNIT	SAMPLE FREQ.	SAMPLE TYPE
Flow	MGD	Continuous	
BOD <sub>5</sub>	mg/L	3/Week	24-hr Flow Prop Comp
Suspended Solids	mg/L	3/Week	24-hr Flow Prop Comp
Explanation of influent changes from previous permit: Addition of influent flow monitoring.			

## PROPOSED PERMIT MONITORING AND LIMITATIONS – EFFLUENT

Outfall Location: The west bank of the upper Baraboo River, downstream of Glenwood Park in Kendall, WI. 43.7863N 90.36580W NW 1/4, SE 1/4, SW 1/4, S 10, T15 R1E			
Outfall No: 001	Sample Description: Prior to discharge to the Baraboo River, representative composite samples shall be collected in the UV channel before UV disinfection and grab samples shall be collected in the UV channel after UV disinfection.		
PARAMETER	LIMITATION	SAMPLE FREQ	SAMPLE TYPE
BOD <sub>5</sub>	45 mg/L weekly ave, 30 mg/L monthly ave	3/Week	24 hr Fl Prop Comp

<b>Suspended Solids</b>	45 mg/L weekly ave, 30 mg/L monthly ave	3/Week	24 hr Fl Prop Comp
<b>pH</b>	9.0 su Daily Max, 6.0 su Daily Min	Daily	Grab
<b>Fecal Coliform</b> May-Sept	400#/100 mL Monthly Geometric Mean 656#/100 mL Weekly Geometric Mean	Weekly	Grab
<b>Copper</b> 2022 only	µg/L	Quarterly	24 hr Fl Prop Comp
<b>Ammonia</b> 2022 only	mg/L	Monthly	24 hr Fl Prop Comp
<b>Chloride</b> 2022 only	mg/L	Monthly	24 hr Fl Prop Comp
<b>Phosphorus</b> MDV interim limit effective throughout permit term	0.8 mg/L monthly avg interim limit	Weekly	24 Hr Fl Prop Comp
<b>Phosphorus</b>	lbs/month	Monthly	Calculated
<b>Phosphorus</b>	lbs/year	Annual	Calculated
<b>Temperature, Maximum</b> 2022 only	Deg F	3/Week	Continuous

**Explanation of effluent changes from last permit:** 1) removal of effluent flow monitoring since flow now monitored at the influent sample point, 2) lower effluent phosphorus interim limits associated with an approved multi-discharger variance for phosphorus (MDV) and compliance schedules to comply with s. 283.16, Wis. Stats. requirements for phosphorus, 3) addition of weekly geometric mean limit for fecal coliform 4) removal of chlorine monitoring and limits, 5) addition of chloride monitoring in the 4<sup>th</sup> year of the permit, and 6) reduction of monitoring for copper and ammonia nitrogen to only 4<sup>th</sup> year of the permit term.

**Explanation of limits and monitoring:**

Limits were determined using chs. NR 102, 105, 106, 205, 210, and 217 of the Wisconsin Administrative Code (where applicable). The effluent limits for BOD5, TSS, and pH are based on NR 210. Limitations for these substances are protective of the receiving water uses and associated water quality criteria. For more information see the September 19, 2018 memo from Wade Strickland to Angela Parkhurst, prepared by John Dougherty, titled "Water Quality Based Effluent Limitations for the Kendall Wastewater Treatment Facility WPDES Permit No. WI-0020515-10-0."

**Chlorine monitoring or limits:** N/A, UV disinfection now used.

**Chloride monitoring or limits:** Monthly monitoring only during 4th yr of permit

**Ammonia monitoring or limits:** Monthly monitoring only during 4th yr of permit

**Copper monitoring or limits:** Quarterly monitoring only during 4th yr of permit.

**Phosphorus monitoring or limits:** Phosphorus rules became effective December 1, 2010 per NR 217, Wis. Adm. Code, that required the permittee to comply with water quality based effluent limits (WQBELs) for total phosphorous. The final phosphorus WQBELs for Kendall are of 0.225 mg/L (monthly average) and 0.075 mg/L & 0.044 lbs/day (6-month averages) and were to become effective as scheduled unless a variance was granted. For this permit term, the permittee has applied for the Multi-Discharger Variance (MDV) for phosphorus as provided for in s. 283.16, Wis. Stats., and approved by USEPA on February 6, 2017 until February 5, 2027. The permittee qualifies for the MDV because it is an existing source and a major facility upgrade is needed to comply with the applicable phosphorus WQBELs, thereby creating a financial burden. The initial interim limit for this issuance is a 0.8 mg/L (monthly average) and is effective through 12/31/2023. The interim limit was derived using 2 months of DMR data from the new plant, May and June 2018.

Conditions of the MDV require the permittee to optimize phosphorus removal throughout the proposed permit term, comply with interim limits and make annual payments to participating county(s) by March 1 of each year based on the pounds of phosphorus discharged during the previous year in excess of the specified target value. The “price per pound” value is \$52.02 adjusted for CPI annually during the first quarter as defined by s. 283.16(8)(a)2, Wis. Stats and takes effect for reissued permits with effective dates starting April 1, 2018. This may differ from the “price per pound” that is public noticed; however, the “price per pound” is set upon reissuance and is applicable for the entire permit term. The participating county(s) uses these payments to implement non-point source (agricultural and urban) phosphorus control strategies at the watershed level.

For additional information see the following documents:

- The “Phosphorus Multidischarger Variance Application for Municipal Facilities” submitted by the permittee, 06/29/2018
- The 07/25/2018 “Multidischarger Variance Evaluation Checklist” completed by the department
- The 07/26/2018 letter from the DNR granting “Conditional Approval of a multidischarger phosphorus variance”

**Wisconsin River Total Maximum Daily Load (TMDL):** There is a major effort underway to improve water quality in the Wisconsin River Basin. The framework for this effort is a Total Maximum Daily Load (TMDL), which is the maximum amount of a pollutant that a body of water can receive while still meeting water quality standards. The Wisconsin River TMDL project area spans Wisconsin's central corridor from the headwaters in Vilas County to Lake Wisconsin in Columbia County, covering 9,156 square miles—approximately 15 percent of the state. The TMDL will set phosphorus allocations for facilities throughout the project area, and total suspended solids (TSS) allocations in sub-basins that drain to TSS impaired waterways. Allocations established by the TMDL will be included in WPDES permits, which may result in limits different than those calculated in the WQBEL memo used for this reissuance. TMDL-derived limits may be included in lieu of or in addition to the calculated limits upon permit reissuance or modification once the TMDL has been approved by U.S. EPA, according to s. NR 217.16, Wis. Adm. Code. For more information see the Department’s web site <http://dnr.wi.gov/topic/TMDLs/WisconsinRiver/>.

To receive email updates about the Wisconsin River TMDL see the Department’s web site [https://public.govdelivery.com/accounts/WIDNR/subscriber/new?topic\\_id=WIDNR\\_676](https://public.govdelivery.com/accounts/WIDNR/subscriber/new?topic_id=WIDNR_676).

**Temperature:** Temperature monitoring during the 4th year of the permit will continue

## PROPOSED BIOMONITORING REQUIREMENTS

Is biomonitoring required at this outfall? No		IWC= N/a	Primary Control Water Location: Baraboo River
Qs:Qe: 16.6:1	Discussion of existing biomonitoring data: See WET checklist and limits memo referenced above.		
If the stream class at the discharge point is other than Fish and Aquatic Life (FFAL), how far down stream is the next Fish and Aquatic Life stream? Stream is Cold Water, which is more restrictive than FFAL.			

## DISINFECTION

Is disinfection required for this discharge? Yes, seasonally May - September
Type of disinfection: UV
Discussion: New plant has UV disinfection.

## LAND APPLICATION SECTION

### SLUDGE REQUIREMENTS

All sludge management requirements were determined ch. NR 204, Wis. Adm. Code

<b>Land Application</b> <b>Sample Number: 002</b>		<b>Sample Location:</b> If sludge is shipped to the City of Elroy WWTF for disposal, representative sludge grab samples shall be collected once per year from the sludge standpipe and monitored for List 1 parameters. Sludge samples shall be collected prior to hauling and test results shall be reported on Form 3400-49 "Waste Characteristics Report". Hauled sludge reports shall be submitted on Form 3400-52 "Other Methods of Disposal or Distribution Report" following each year that sludge is hauled. If sludge will be land applied on Department approved sites instead of hauled to another Department approved storage facility for storage and disposal, monitoring shall include parameters in Lists 1, 2, 3, and 4. PCB monitoring shall occur once in 2020 whether sludge is hauled or land applied.			
Sludge # (3 digits)	Sludge Class (A or B)	Liquid or Cake	Pathogen Reduction Method	Vector Attraction Reduction Method	Reuse Option
002	B	Liquid	aerobic digestion	Volatile Solids Reduction	Sludge hauled/land applied
Sludge Management Adequate? Yes					
Sludge Storage Required? Sludge is hauled to the Elroy WWTF, or land applied with prior approval of landspreading sites.					
Radium Requirements: Is radium-226 present in the water supply at a level greater than 2 pCi/L? no					
Is a priority pollutant scan required? No					
Explanation of Changes: The option of land applying sludge on Department approved sites has been added to the sludge sample point and associated sampling parameters.					

## PROPOSED COMPLIANCE SCHEDULES

### Phosphorus Payment per Pound to County

The permittee is required to make annual payments for phosphorus reductions to the participating county or counties in accordance with s. 283.16(8), Wis. Stats, and the following schedule. The price per pound will be set at the time of permit reissuance and will apply for the duration of the permit.

Required Action	Due Date
<p><b>Annual Verification of Phosphorus Payment to County:</b> The permittee shall make a total payment to the participating county or counties approved by the Department by March 1 of each calendar year. The amount due is equal to the following: [(lbs of phosphorus discharged minus the permittee's target value) times (\$[52.02] per pound)] or \$640,000, whichever is less. See the payment calculation steps in the Surface Water section.</p> <p>The permittee shall submit Form 3200-151 to the Department by March 1 of each calendar year indicating total amount remitted to the participating counties to verify that the correct payment was made. The first payment verification form is due by the specified Due Date.</p> <p>Note: The applicable Target Value is 0.2 mg/L as defined by s. 283.16(1)(h), Wis. Stats. The "per pound" value is \$50.00 adjusted for CPI.</p>	03/01/2020
<b>Annual Verification of Payment #2:</b> Submit Form 3200-151 to the Department indicating total amount remitted to the participating counties.	03/01/2021
<b>Annual Verification of Payment #3:</b> Submit Form 3200-151 to the Department indicating total amount remitted to the participating counties.	03/01/2022
<b>Annual Verification of Payment #4:</b> Submit Form 3200-151 to the Department indicating total amount remitted to the participating counties.	03/01/2023
<b>Annual Verification of Payment #5:</b> Submit Form 3200-151 to the Department indicating total amount remitted to the participating counties.	03/01/2024
<b>Continued Coverage:</b> If the permittee intends to seek a renewed variance, an application for the MDV (Multi Discharger Variance) shall be submitted as part of the application for permit reissuance in accordance with s. 283.16(4)(b), Wis. Stats.	
<b>Annual Verification of Payment After Permit Expiration:</b> In the event that this permit is not reissued prior to the expiration date, the permittee shall continue to submit Form 3200-151 to the Department indicating total amount remitted to the participating counties by March 1 each year.	

**Explanation of Phosphorus Compliance Schedules:** The permittee applied for the multi-discharger variance (MDV) for the effluent phosphorus limitations and was conditionally approved for the MDV. Subsection 283.16(6)(b), Wis. Stats., requires permittees that have received approval for the multi-discharger variance (MDV) to implement a watershed project that is designed to reduce non-point sources of phosphorus within the HUC 8 watershed in which the permittee is located. The permittee has selected the "Payment to Counties" watershed option described in s. 283.16(8), Wis. Stats. Under this option the permittee shall make annual payment(s) to participating county(s) that are calculated based on the amount of phosphorus actually discharged during a calendar year in pounds per year less the amount of phosphorus that would have been discharged had the permittee discharged phosphorus at a target value concentration of 0.2 mg/L. The pounds of phosphorus discharged in excess of the target value is multiplied by a per pound phosphorus charge that will equal \$52.02 per pound. This schedule requires the permittee to submit Form 3200-151 to the Department indicating the total amount remitted to the participating county(s).

### Phosphorus Schedule - Optimization

The permittee is required to optimize performance to control phosphorus discharges per the following schedule.

Required Action	Due Date
<b>Optimization Plan:</b> The permittee shall prepare an Optimization Plan and submit it for Department approval. The plan shall include an evaluation of collected effluent data, possible source reduction measures and operational improvements to optimize performance to control phosphorus discharges. The plan shall contain a schedule for implementation of the measures and improvements. Once the plan is approved by the Department, the permittee shall take the steps called for in the Optimization Plan and follow the schedule of implementation as approved.	12/31/2019
<b>Progress Report #2:</b> Submit a progress report on optimizing removal of phosphorus.	12/31/2020
<b>Progress Report #3:</b> Submit a progress report on optimizing removal of phosphorus.	12/31/2021
<b>Progress Report #4:</b> Submit a progress report on optimizing removal of phosphorus.	12/31/2022
<b>Progress Report #5:</b> Submit a progress report on optimizing removal of phosphorus.	12/31/2023

**Explanation of Compliance Schedule:** Per s. 283.16(6)(a), Wis. Stats. the Department may include a requirement that the permittee optimize the performance of a point source in controlling phosphorus discharges, which may be necessary to achieve compliance with multi-discharger variance interim limits. This compliance schedule requires the permittee to prepare an optimization plan with a schedule for implementation and submit it for Department approval. The permittee shall take the steps called for in the optimization plan and submit annual progress reports on optimizing the removal of phosphorus.

## OTHER COMMENTS

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**Proposed expiration date:** December 31, 2023

**Prepared by:** Angela Parkhurst

**Date:** October 31, 2018



## CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: September 19, 2018

TO: Angela Parkhurst – WCR, Eau Claire Service Center

FROM: Wade Strickland – WY/3

*Dean Sigel for WLF*SUBJECT: Water Quality-Based Effluent Limitations for the Kendall Wastewater Treatment Facility  
WPDES Permit No. WI-0020515-10-0

This is in response to your request for an evaluation of the need for water quality-based effluent limitations using Chapters NR 102, 104, 105, 106, 207, 210, 212, and 217 of the Wisconsin Administrative Code (where applicable), for the discharge from the Kendall Wastewater Treatment Facility in Monroe County. This municipal wastewater treatment facility (WWTF) discharges to the Baraboo River, located in the Seymour Creek and Upper Baraboo River Watershed in the Lower Wisconsin River Basin. The evaluation of the permit recommendations is discussed in more detail in the attached report.

No changes are recommended in the permit limitations for BOD<sub>5</sub>, Total Suspended Solids, pH, and Fecal Coliforms. Based on our review, the following recommendations are made on a chemical-specific basis:

## Outfall 001

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
BOD <sub>5</sub>			45 mg/L	30 mg/L		1
TSS			45 mg/L	30 mg/L		1
pH	9.0 s.u.	6.0 s.u.				1
Fecal Coliforms May – September			<b>656#/100 mL</b> geometric mean	400#/100 mL geometric mean		4
Phosphorus Interim Final				0.8 mg/L 0.225 mg/L	0.075 mg/L 0.044 lb/day	2,5
Copper						3
Ammonia Nitrogen						3
Chloride						3
Temperature, Max						3
WET						6

## Footnotes:

1. No changes from the current permit
2. A Total Maximum Daily Load (TMDL) is being developed for the Wisconsin River to address total phosphorus water quality impairments within the TMDL area. This TMDL will likely result in limitations for phosphorus that must be included in WPDES permits, which may be different than those calculated for this reissuance. TMDL-derived limits may be included in lieu of or in addition to the calculated limits upon permit reissuance or modification once the TMDL has been approved by U.S. EPA, according to s. NR 217.16, Wis. Adm. Code.
3. Monitoring in the fourth year of the permit term
4. Additional limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7) are included in bold.

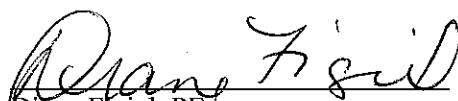
5. Under the phosphorus MDV, a level currently achievable (LCA) interim limit of 0.8 mg/L should be effective upon permit reissuance. The final water quality based effluent limits remain at 0.225 mg/L as a monthly average and 0.075 mg/L as a six-month average, as well as a respective mass limit.
6. No WET testing is required based on Chapter 1.11 of the WET Guidance (WET Testing of Minor Municipal Discharges). This is a minor municipal (< 1.0 MGD) discharge comprised solely of domestic wastewater, with no WET failures and no toxic compounds detected at levels of concern. Because there is a very low risk of toxicity, no WET testing is recommended.

Please consult the attached report for details regarding the above recommendations. If there are any questions or comments, please contact John Dougherty at [John.Dougherty@Wisconsin.gov](mailto:John.Dougherty@Wisconsin.gov) or Diane Figiel at (608) 264-6274 or [Diane.Figiel@wisconsin.gov](mailto:Diane.Figiel@wisconsin.gov).

Attachments (3) – Narrative, Thermal Table & Map

PREPARED BY: John Dougherty, Wastewater Engineer

APPROVED BY:

  
Diane Figiel, PE,  
Water Resources Engineer

Date:

9/19/18

E-cc: Peter Pfefferkorn, Wastewater Engineer – WCR, WI Rapids Service Center  
Lacey Hillman, Regional Wastewater Supervisor – CO, Eau Claire Service Center  
Ben Hartenbower - WCR

## Water Quality-Based Effluent Limitations for Kendall Wastewater Treatment Facility

WPDES Permit No. WI-0020516-10-0

Prepared by: John Dougherty

### PART 1 – BACKGROUND INFORMATION

**Facility Description:** The Kendall Wastewater Treatment Facility includes a mechanical fine screen, activated sludge package plant, aerobic digestion, blowers, sludge storage, chemical phosphorus removal, and UV disinfection.

Attachment #2 is a map of the area showing the approximate location of Outfall 001.

**Existing Permit Limitations:** The current permit, expiring on December 31, 2018, includes the following effluent limitations.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
BOD <sub>5</sub>			45 mg/L	30 mg/L	1
TSS			45 mg/L	30 mg/L	1
pH	9.0 s.u.	6.0 s.u.			1
Ammonia Nitrogen					2
Fecal Coliforms May – September				400#/100 mL geometric mean	
Residual Chlorine	38 µg/L				3
Phosphorus, Total				6.0 mg/L	4

**Footnotes:**

1. These limitations are not being evaluated as part of this review. Because the water quality criteria (WQC), reference effluent flow rates, and receiving water characteristics have not changed, limitations for these water quality characteristics do not need to be re-evaluated at this time.
2. Monitoring only
3. Chlorine has been replaced with UV disinfection.
4. This is an interim limit. The final water quality based effluent limit is 0.075 mg/L as six-month average, 0.044 lbs/day as a six-month average, and 0.225 mg/L as a monthly average. A compliance schedule is in the current permit to meet the final WQBEL.

**Receiving Water Information:**

- Name: Baraboo River
- Classification: Cold-water sport fish community, non-public water supply.
- Low Flow: The following 7-Q<sub>10</sub> and 7-Q<sub>2</sub> values are from USGS Station at NE ¼, SW ¼, SEC. 10, T15N-R1E, Monroe County, at Highway 71 Bridge, Kendall, WI. The Harmonic Mean has been estimated as recommended in *State of Wisconsin Water Quality Rules Implementation Plan* (Publ. WT-511-98)

# Attachment #1

7-Q<sub>10</sub> = 1.8 cfs (cubic feet per second)

7-Q<sub>2</sub> = 2.6 cfs

90-Q<sub>10</sub> = 2.2 cfs

Harmonic Mean Flow = 5.4 cfs

- Hardness = 149 mg/L as CaCO<sub>3</sub>. This value represents the geometric mean of data from WET testing done at the Union Center Wastewater Treatment Facility from 05/03/2011 to 07/15/2014. Hardness data for the Baraboo River at Kendall was not available at Union Center, just downstream, is considered a reasonable approximation.
- % of low flow used to calculate limits: 25%
- Source of background concentration data: Metals data from Baraboo River at Reedsburg is used for this evaluation because there is no data available for the Baraboo River at Kendall. The Baraboo River at Reedsburg is downstream of Kendall and is within the same ecological landscape so ambient water quality characteristics are expected to be similar. The numerical values are shown in the tables below. If no data is available, the background concentration is assumed to be negligible and a value of zero is used in the computations. Background data for calculating effluent limitations for ammonia nitrogen are described later.
- Multiple dischargers: There are no additional dischargers in the immediate vicinity.
- Impaired water status: The Baraboo River listed as impaired for a total phosphorus upstream and downstream of the discharge from stream miles 108.60 to 118.93.

## Effluent Information:

- Design Flow Rate(s):  
Annual average = 0.07 MGD (Million Gallons per Day)  
For reference, the actual average flow from June 2013 to June 2018 was 0.057 MGD.
- Hardness = 220 mg/L as CaCO<sub>3</sub>. This value represents the geometric mean of data from hardness data from WET testing performed on 12/10/2014 and 08/10/2016.
- Acute dilution factor used: Not applicable – this facility does not have an approved Zone of Initial Dilution (ZID).
- Water Source: Municipal Wells #2 and #4
- Additives: Ferric Chloride for phosphorus removal
- Effluent characterization: This facility is categorized as a minor municipality and was given instructions to forgo sampling for a limited number of common pollutants.

	Copper µg/L
1-day P <sub>99</sub>	55.9
4-day P <sub>99</sub>	32.1
30-day P <sub>99</sub>	19.99
Mean	14.66
Std	11.08
Sample size	19
Range	3.375 – 40.8

Effluent data for substances for which a single sample was analyzed is shown in the tables in Part 2 below, in the column titled "MEAN EFFL. CONC.".

# Attachment #1

The following table presents the average concentrations and loadings at Outfall 001 from June 2013 to June 2018 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6):

	Average Measurement	Average Mass Discharged
BOD <sub>5</sub>	19.4 mg/L	9.22 lbs/day
TSS	12.7 mg/L	6.03 lbs/day
pH field	7.14 s.u.	-
Phosphorus	2.1 mg/L	0.099 lbs/day
Ammonia Nitrogen	4.5 mg/L*	-
Copper	13.3 µg/L	-

\*Results below the level of detection (LOD) were included as zeroes in calculation of average.

## PART 2 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR TOXIC SUBSTANCES – EXCEPT AMMONIA NITROGEN

In general, permit limits for toxic substances are recommended whenever any of the following occur:

1. The maximum effluent concentration exceeds the calculated limit (s. NR 106.05(3), Wis. Adm. Code)
2. If 11 or more detected results are available in the effluent, the upper 99<sup>th</sup> percentile (or P<sub>99</sub>) value exceeds the comparable calculated limit (s. NR 106.05(4), Wis. Adm. Code)
3. If fewer than 11 detected results are available, the mean effluent concentration exceeds 1/5 of the calculated limit (s. NR 106.05(6), Wis. Adm. Code)

### Acute Limits based on 1-Q<sub>10</sub>

Daily maximum effluent limitations for toxic substances are based on the acute toxicity criteria (ATC), listed in ch. NR 105, Wis. Adm. Code. Previously daily maximum limits for toxic substances were calculated as two times the ATC. However, changes to ch. NR 106, Wis. Adm. Code (September 1, 2016) require the Department to calculate acute limitations using the same mass balance equation as used for other limits along with the 1-Q<sub>10</sub> receiving water low flow to determine if more restrictive effluent limitations are needed to protect the receiving stream from discharges which may cause or contribute to an exceedance of the acute water quality standards.

$$\text{Limitation} = \frac{(\text{WQC}) (Q_s + (1-f) Q_e) - (Q_s - f Q_e) (C_s)}{Q_e}$$

Where:

WQC = Acute toxicity criterion or secondary acute value according to ch. NR 105

Q<sub>s</sub> = average minimum 1-day flow which occurs once in 10 years (1-day Q<sub>10</sub>)

if the 1-day Q<sub>10</sub> flow data is not available = 80% of the average minimum 7-day flow which occurs once in 10 years (7-day Q<sub>10</sub>).

Q<sub>e</sub> = Effluent flow (in units of volume per unit time) as specified in s. NR 106.06(4)(d)

f = Fraction of the effluent flow that is withdrawn from the receiving water, and

C<sub>s</sub> = Background concentration of the substance (in units of mass per unit volume) as specified in s. NR 106.06(4)(e).

As a rule of thumb, if the receiving water is effluent dominated under low stream flow conditions, the 1-Q<sub>10</sub> method of limit calculation produces the most stringent daily maximum limitations and should be used while making reasonable potential determinations.

The following tables list the water quality-based effluent limitations for this discharge along with the results of effluent sampling for all the detected substances. All concentrations are expressed in term of micrograms per Liter (µg/L), except for hardness (mg/L).

#### Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

RECEIVING WATER FLOW = 1.44 cfs, (1-Q<sub>10</sub> (estimated as 80% of 7-Q<sub>10</sub>)).

SUBSTANCE	REF. HARD. mg/L	ATC	MEAN BACK- GRD.	MAX. EFFL. LIMIT*	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	1-day P <sub>99</sub>	1-day MAX. CONC.
Copper	220	32.7		65.3			55.9	40.8

\* The 2 x ATC method of limit calculation yields a more restrictive limit than consideration of ambient concentrations and 1-Q<sub>10</sub> flow rates per the changes to s. NR 106.07(3), Wis. Adm. Code, effective 09/01/2016.

#### Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

RECEIVING WATER FLOW = 0.45 cfs (¼ of the 7-Q<sub>10</sub>)

SUBSTANCE	REF. HARD.* mg/L	CTC	MEAN BACK- GRD.	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	4-day P <sub>99</sub>
Copper	149	14.56		75.1			32.1

#### Monthly Average Limits based on Wildlife Criteria (WC) Human Threshold Criteria (HTC) Human Cancer Criteria (HCC)

The effluent characterization did not include any effluent sampling results for substances for which Wildlife, Human Threshold, and Human Cancer Criteria exist.

**Conclusions and Recommendations:** Based on a comparison of the effluent data and calculated effluent limitations, effluent limitations for copper are not recommended.

**Mercury** – The permit application did not require monitoring for mercury because the Kendall Wastewater Treatment Facility is categorized as a minor facility as defined in s. NR 200.02(8), Wis. Adm. Code. In accordance with s. NR 106.145(3)(a)3., a minor municipal discharger shall monitor and report results of influent and effluent mercury monitoring once every three months if, “there are two or more exceedances in the last five years of the high-quality sludge mercury concentration of 17 mg/kg specified in s. NR 204.07(5).” A review of the past five years of sludge characteristics data reveals that all the sample results are within expected analytical ranges and well below the 17 mg/kg level. The average concentration in the sludge from 09/24/2014 and 11/02/2015 was 0.41 mg/kg, with a maximum reported concentration of 0.74 mg/kg. Therefore, no mercury monitoring is recommended at Outfall 001.

**Chloride monitoring recommendations:** Monthly monitoring in the fourth year of the permit term is recommended. This will allow enough data points for a P<sub>99</sub> analysis to be compared against the calculated limits.

### PART 3 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR AMMONIA NITROGEN

The State of Wisconsin promulgated revised water quality standards for ammonia nitrogen effective March 1, 2004 which includes criteria based on both acute and chronic toxicity to aquatic life. The current permit has daily maximum, weekly average and monthly average limits for Outfall 001 (calculated in 2013). These limits are re-evaluated at this time due to the following changes:

- Updates to subchapter IV of ch. NR 106, Wis. Adm. Code allow limits based on available dilution instead of limits set to twice the acute criteria.

The State of Wisconsin promulgated revised water quality standards for this substance effective March 1, 2004 which includes criteria based on both acute and chronic toxicity to aquatic life. Given the fact that the Kendall Wastewater Treatment Facility does not currently have ammonia nitrogen limits, the need for limits is evaluated at this time.

#### **Daily Maximum Limits based on Acute Toxicity Criteria (ATC):**

Daily maximum limitations are based on acute toxicity criteria, which are a function of the effluent pH and the receiving water classification. The acute toxicity criterion (ATC) for ammonia is calculated using the following equation.

$$\text{ATC in mg/L} = [A \div (1 + 10^{(7.204 - \text{pH})})] + [B \div (1 + 10^{(\text{pH} - 7.204)})]$$

Where:

A = 0.411 and B = 58.4 for a Cold Water Category 5 fishery, and  
pH (s.u.) = that characteristic of the effluent.

The effluent pH data for the past three years was examined as part of this evaluation. A total of 1856 sample results were reported from June 2013 to June 2018. The maximum reported value was 7.60 s.u. (Standard pH Units), and a pH of greater than 7.38 s.u. was reported forty times. More than 99% of the time the pH was 7.44 s.u. or less. The 1-day  $P_{99}$ , calculated in accordance with s. NR 106.05(5), is 7.38 s.u. And the mean plus the standard deviation multiplied by a factor of 2.33, an estimate of the upper ninety ninth percentile for a normally distributed dataset, is 7.383 s.u. A value of 7.44 s.u. is believed to represent the maximum reasonably expected pH, and therefore most appropriate for determining daily maximum limitations for ammonia nitrogen. Substituting a value of 7.44 s.u. into the equation above yields an ATC = 21.7 mg/L and a computed daily maximum limit of 43.4 mg/L using two times the ATC.

The Baraboo River at the point of discharge is classified as a cool water at the point of discharge. After discussions with local fishery biologists and analysis using the *Wisconsin Department of Natural Resources Distribution of Wisconsin Fish Species*, it is determined that Rainbow trout are not present in this section of the Baraboo River. Further, there are believed to be no naturally reproducing populations of rainbow trout in Monroe County. However, Brook trout and Brown trout are present. Given these populations and using the Department's guidance on Ammonia limits, a cold-water category 5 classification is appropriate for the calculation of daily maximum limits using two times the ATC approach.

#### **Potential changes to daily maximum Ammonia Nitrogen effluent limitations:**

Updates to subchapter IV of ch. NR 106, Wis. Adm. Code (effective September 1, 2016) outline the option for the Department to implement use of the 1-Q<sub>10</sub> receiving water low flow to calculate daily maximum ammonia nitrogen limits if it is determined that the previous method of acute ammonia limit

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calculation (2×ATC) is not sufficiently protective of the fish and aquatic life. The more restrictive calculated limits would apply.

The calculated daily maximum ammonia nitrogen effluent limits using the mass balance approach with the 1-Q<sub>10</sub> (estimated as 80 % of 7-Q<sub>10</sub>) and the 2×ATC approach are shown below.

Summary of Calculated Daily Maximum Ammonia Nitrogen Effluent Limitations, in mg/L

Method	Ammonia Nitrogen Limit (mg/L)
2×ATC	43.4
1-Q <sub>10</sub>	309.64

The 2×ATC method yields the most stringent limits for the Kendal Wastewater Treatment Facility.

#### Weekly Average & Monthly Average Limits based on Chronic Toxicity Criteria (CTC)

The ammonia limit calculation also warrants evaluation of weekly and monthly average limits based on chronic toxicity criteria for ammonia, since those limits relate to the assimilative capacity of the receiving water.

Ammonia limits were last calculated in 2013. At that time, default stream pH and temperatures were used to calculate limits. At this time, more specific information is available for both parameters which warrant a re-calculation of weekly and monthly average limits. New default temperature data are available for relatively small warm water streams as part of the state's new thermal standards; the new default ambient stream temperatures are contained in Table 2 of ch. NR 102. Seasonal mean pH values are now available for the Baraboo River in Monroe County. The new ambient values are used in conjunction with the effluent and stream low flows to re-calculate limits using the procedure in s. NR 106.32, Wis. Adm. Code.

Weekly average and monthly average limits for ammonia nitrogen are based on chronic toxicity criteria. The 30-day chronic toxicity criterion (CTC) for ammonia in waters classified for a Cold-Water Community is calculated by the following equation.

$$CTC = E \times \{ [0.0676 \div (1 + 10^{(7.688 - pH)})] + [2.912 \div (1 + 10^{(pH - 7.688)})] \} \times C$$

Where:

pH = the pH (s.u.) of the receiving water,

E = 0.854,

C = the minimum of 2.85 or  $1.45 \times 10^{(0.028 \times (25 - T))}$ ,

T = the temperature (°C) of the receiving water

The 4-day criterion is simply equal to the 30-day criterion multiplied by 2.5. The 4-day criteria are used in a mass-balance equation with the 7-Q<sub>10</sub> (4-Q<sub>3</sub>, if available) to derive weekly average limitations. And the 30-day criteria are used with the 30-Q<sub>5</sub> (estimated as 85% of the 7-Q<sub>2</sub> if the 30-Q<sub>5</sub> is not available) to derive monthly average limitations. The stream flow value is further adjusted to temperature; 100% of the flow is used if the Temperature ≥ 16 °C, 25% of the flow is used if the Temperature < 11 °C, and 50% of the flow is used if the Temperature ≥ 11 °C but < 16 °C.



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Since minimal ambient data is available, the “default” basin assumed values are used for Temperature, pH and background ammonia concentrations, shown in the table below, with the resulting criteria and effluent limitations.

		Spring	Summer	Winter
		April & May	June – Sept.	Oct. – March
<b>Effluent Flow</b>	Qe (MGD)	0.07	0.07	0.07
<b>Background Information</b>	7-Q <sub>10</sub> (cfs)	1.80	1.80	1.80
	7-Q <sub>2</sub> (cfs)	2.60	2.60	2.60
	Ammonia (mg/L)	0.06	0.06	0.085
	Temperature (°C)	11	17	4
	pH (s.u.)	7.85	7.9	7.83
	% of Flow used	50	100	25
	Reference Weekly Flow (cfs)	0.9	1.8	0.45
	Reference Monthly Flow (cfs)	1.105	2.21	0.5525
<b>Criteria mg/L</b>	4-day Chronic	7.47	5.96	7.66
	30-day Chronic	2.99	2.38	3.07
<b>Effluent Limits mg/L</b>	Weekly Average	69.04	104.01	39.15
	Monthly Average	32.86	49.80	18.27

### Effluent Data

The following table evaluates the statistics based upon ammonia data reported from June 2013 to June 2018, with those results being compared to the calculated limits to determine the need to include ammonia limits in the Kendall Wastewater Treatment Facility permit for the respective month ranges. That need is determined by calculating 99<sup>th</sup> upper percentile (or P<sub>99</sub>) values for ammonia during each of the month ranges and comparing the daily maximum values to the calculated daily, weekly, and monthly limits. Based on this comparison, ammonia effluent limits are not required at any point throughout the year.

Ammonia mg/L	April - May	June - September	October - March
1-day P <sub>99</sub>	33.0	28.9	30.9
4-day P <sub>99</sub>	18.0	15.6	16.9
30-day P <sub>99</sub>	8.57	8.12	8.05
Mean*	4.74	5.02	4.47
Std	7.14	6.02	6.68
Sample size	13	18	30
Range	< 0 – 22.2	< 0 – 18.9	< 0 – 18.8

### Conclusions and Recommendations:

In summary, there is no reasonable potential for an exceedance of ammonia nitrogen limits. Therefore, no limits are recommended for ammonia nitrogen. No mass limitations are recommended in accordance with s. NR 106.32(5).

**PART 4 –PHOSPHORUS****Technology Based Effluent Limit (TBL)**

Wisconsin Administrative Code, ch. NR 217, requires municipal wastewater treatment facilities that discharge greater than 150 pounds of Total Phosphorus per month to comply with a monthly average limit of 1.0 mg/L, or an approved alternative concentration limit.

Because Kendall Wastewater Treatment Facility does not currently have an existing technology-based limit, the need for this limit in the reissued permit, is evaluated. The data demonstrates that the annual monthly average phosphorus loading is less than 150 lbs/month, which is the threshold for municipalities in accordance to s. NR 217.04(1)(a)1, and therefore no technology-based limit is recommended.

Sample Date	Monthly Avg. mg/L	Total Flow MG/month	Total Phosphorus lb./mo.
Jan 2017	0.118	2.47	2.43
Feb 2017	0.116	2.44	2.37
Mar 2017	0.188	3.04	4.76
April 2017	0.233	3.05	5.92
May 2017	0.190	2.91	4.60
June 2017	0.280	2.08	4.86
July 2017	0.437	3.52	12.82
Aug 2017	0.085	1.86	1.30
Sept 2017	0.325	1.33	3.60
Oct 2017	0.586	0.86	4.20
Nov 2017	0.430	0.78	2.80
Dec 2017	0.243	0.82	1.70
Average =			3.57

$$\text{Total P (lbs/month)} = \text{Monthly average (mg/L)} \times \text{total flow (MGD)} \times 8.34 \text{ (lbs/gallon)}$$

In addition, the need for a water quality based effluent limit for phosphorus must be considered.

**Water Quality-Based Effluent Limits (WQBEL)**

Revisions to administrative rules regulating phosphorus took effect on December 1, 2010. These rule revisions include additions to ch. NR 102 (s. NR 102.06), which establish phosphorus standards for surface waters. Revisions to ch. NR 217 (s. NR 217, Subchapter III) establish procedures for determining water quality based effluent limits for phosphorus, based on the applicable standards in ch. NR 102.

Section NR 102.06(3)(a) specifically names reaches of rivers for which a phosphorus criterion of 0.1 mg/l applies. For other stream segments that are not specified in s. NR 102.06(3)(a), s. NR 102.06(3)(b), Wis. Adm. Code, specifies a phosphorus criterion of 0.075 mg/L. The phosphorus criterion of 0.075 mg/L applies for the Baraboo River.

The conservation of mass equation is described in s. NR 217.13 (2)(a), Wis. Adm. Code, for phosphorus WQBELs and includes variables of water quality criterion (WQC), receiving water flow rate (Qs), effluent flow rate (Qe), and upstream phosphorus concentrations (Cs):

$$\text{Limitation} = [(WQC)(Q_s + (1-f) Q_e) - (Q_s - f Q_e) (C_s)] / Q_e$$

Where:

WQC = 0.075 mg/L for the Baraboo River.

$Q_s$  = 100% of the 7- $Q_2$  of 2.6 cfs

$C_s$  = background concentration of phosphorus in the receiving water pursuant to s. NR 217.13(2)(d), Wis. Adm. Code

$Q_e$  = effluent flow rate = 0.07 MGD = 0.108 cfs

$f$  = the fraction of effluent withdrawn from the receiving water ( $f = 0$ )

A previous evaluation resulted in a WQBEL of 0.075 mg/L using a background concentration of 0.138 mg/L. Section NR 217.13(2)(d) states that the determination of upstream concentrations shall be evaluated at each permit reissuance. Additional data were considered in estimating the background phosphorus concentration.

Section NR 217.13(2)(d), Wis. Adm. Code, specifies that the background phosphorus concentration used in the limit calculation formula shall equal the median of at least four samples collected during the months of May through October, and that all samples collected during a 28-day period shall be considered as a single sample and the average of these concentrations used to determine a median. Averaging begins at date of the first sample in the range of May through October.

A review of all available in stream total phosphorus data from 8 data points collected between 10/10/2007 and 10/10/2012 stored in the Surface Water Integrated Monitoring System database indicates the median background total phosphorus concentration in Baraboo River upstream of the Kendall Wastewater Treatment Facility is mg/L.

In stream total phosphorus data upstream of the discharge is not available however the following data were considered in estimating the background phosphorus concentration (phosphorus data is in mg/L):

SWIMS ID	10011191	10021930	10013905
Monitoring station at	Monitoring station at	Monitoring station at	Monitoring station at
Baraboo River St. 3 –	Baraboo River St. 3 –	M Downstream from	Hwy 71 Bridge Kendall
Bridge W in Kendall	Bridge W in Kendall	Hwy 71 Crossing	(Station 7)
Station Name	Baraboo River	Baraboo River	Baraboo River
Waterbody	Baraboo River	Baraboo River	Baraboo River
Sample Count	1	1	6
First Sample	7/11/2012	10/10/2007	5/8/2012
Last Sample	-	-	10/10/2012
Mean	0.108 mg/L	0.159 mg/L	0.146 mg/L
Median	0.108 mg/L	0.159 mg/L	0.150 mg/L
NR 217 Median	0.108 mg/L	0.159 mg/L	0.150 mg/L

Using all the data above results in a ch. NR 217 median value of 0.148 mg/L. Substituting a median value of 0.148 mg/L into the limit calculation equation above would result in a calculated limit that is less than the applicable criterion of 0.075 mg/L. However, s. NR 217.13(7), Wis. Adm. Code, specifies that “if the water quality-based effluent limitation calculated pursuant to the procedures in this section is less than the

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phosphorus criterion specified in s. NR 102.06, Wis. Adm. Code, for the water body, the effluent limit shall be set equal to the criterion.”

The 303(d)-impaired water listing of the Baraboo River from stream miles 108.60 to 118.93 also points towards the notion that effluent phosphorus limits equal to the water quality criterion are needed to prevent the discharge from contributing to further impairment of the receiving water. Available guidance suggests setting effluent limits equal to the criterion in the absence of an EPA approved total maximum daily load for discharges of phosphorus to phosphorus impaired waters.

#### Effluent Data

The following tables summarizes effluent total phosphorus monitoring data for May, June, and July of 2018. The facility is currently operating a new package plant and data prior to May of 2018 is not representative of current effluent conditions.

Month	Sample Date	Result mg/L	Mean mg/L
May	5/2/2018	0.06	0.185
	5/9/2018	0.16	
	5/15/2018	0.11	
	5/29/2018	0.41	
June	6/4/2018	0.51	0.59
	6/11/2018	0.59	
	6/18/2018	0.63	
	6/25/2018	0.63	
July	7/2/2018	0.56	0.27
	7/9/2018	0.40	
	7/16/2018	0.22	
	7/23/2018	0.22	
	7/30/2018	0.24	

	Phosphorus mg/L
1-day P <sub>99</sub>	1.08
4-day P <sub>99</sub>	0.67
30-day P <sub>99</sub>	0.47
Mean	0.36
Std	0.20
Sample size	13

#### Reasonable Potential Determination

Since the 30-day P<sub>99</sub> of reported effluent total phosphorus data is above the calculated WQBEL, **the discharge has reasonable potential to cause or contribute to an exceedance of the water quality criterion.** Therefore, **a water quality-based effluent limit is recommended.**

#### Limit Expression

Because the calculated WQBEL is less than or equal to 0.3 mg/L, the effluent limit of 0.075 mg/L may be expressed as a six-month average. If a concentration limitation expressed as a six-month average is

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included in the permit, a monthly average concentration limitation of 0.225 mg/L, equal to three times the WQBEL calculated under s. NR 217.13 shall also be included in the permit. The six-month average should be averaged during the months of May – October and November – April.

#### Mass Limits

Because the discharge is to a surface water that is total phosphorus impaired, a mass limit is also required, pursuant to s. NR 217.14(1)(a), Wis. Adm. Code. **This final mass limit shall be  $0.075 \text{ mg/L} \times 8.34 \times 0.07 \text{ MGD} = 0.044 \text{ lb/day}$  expressed as a six-month average.**

#### Multi-Discharge Variance Interim Limit

- (1) With the permit application, Kendall Wastewater Treatment Facility has applied for the phosphorus multi-discharger variance (MDV). Conditions of the phosphorus MDV require the facility to comply with an interim phosphorus limit in lieu of meeting the final water quality based effluent limit for this permit term. The recommended interim limit, pursuant to s. 283.16 (6) 1, Wis. Stats., is 0.8 mg/L as a monthly average.

#### TMDL Under Development

A Total Maximum Daily Load (TMDL) is being developed for the Wisconsin River Basin for phosphorus. The TMDL will address phosphorus water quality impairments within the basins and provide waste load allocations (WLA) required to meet water quality standards. This TMDL will likely result in phosphorus limitations that must be included in WPDES permits, which may be different than those calculated in this WQBEL memo. TMDL-derived phosphorus limits may be included in lieu of or in addition to the calculated limits upon permit reissuance or modification once the TMDL has been approved by U.S. EPA, according to s. NR 217.16, Wis. Adm. Code.

### PART 5 –THERMAL

New surface water quality standards for temperature took effect on October 1, 2010. These new regulations are detailed in chs. NR 102 (Subchapter II – Water Quality Standards for Temperature) and NR 106 (Subchapter V – Effluent Limitations for Temperature) of the Wisconsin Administrative Code. Daily maximum and weekly average temperature criteria are available for the 12 different months of the year depending on the receiving water classification.

In accordance with s. NR 106.53(2)(b), the highest daily maximum flow rate for a calendar month is used to determine the acute (daily maximum) effluent limitation. In accordance with s. NR 106.53(2)(c), the highest 7-day rolling average flow rate for a calendar month is used to determine the sub-lethal (weekly average) effluent limitation. These values were based off actual flow reported from June 2013 to June 2018.

The table below summarizes the maximum temperatures reported during monitoring from January 2017 to December 2017.

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Month	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Weekly Maximum	Daily Maximum	Weekly Average Effluent Limitation	Daily Maximum Effluent Limitation
	(°F)	(°F)	(°F)	(°F)
JAN	54	54	81	120
FEB	53	54	74	120
MAR	50	51	76	98
APR	50	50	80	102
MAY	51	60	76	84
JUN	61	62	76	88
JUL	62	62	72	81
AUG	62	62	71	98
SEP	61	61	64	83
OCT	60	60	65	120
NOV	58	59	67	120
DEC	51	52	64	93

### Reasonable Potential

Comparing the representative highest effluent temperature to the calculated effluent limits determines the reasonable potential of exceeding the effluent limits. Based on the available effluent data no effluent limits are recommended for temperature. The complete thermal table used for calculation is attached.

### Thermal Monitoring

Monthly monitoring in the fourth year of the permit term is recommended. An analysis into the potential need for limits will be done at the next permit reissuance and new data from the recently completed package plant should be available.

## PART 6 – WHOLE EFFLUENT TOXICITY (WET)

WET testing is used to measure, predict, and control the discharge of toxic materials that may be harmful to aquatic life. In WET tests, organisms are exposed to a series of effluent concentrations for a given time and effects are recorded. The following evaluation is based on procedures in the Department's WET Program Guidance Document (revision #11, dated November 1, 2016).

- Acute tests predict the concentration that causes lethality of aquatic organisms during a 48 to 96-hour exposure. To assure that a discharge is not acutely toxic to organisms in the receiving water, WET tests must produce a statistically valid LC<sub>50</sub> (Lethal Concentration to 50% of the test organisms) greater than 100% effluent.
- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), a synthetic (standard) laboratory water may be used as the dilution water and primary control in acute WET tests, unless the use of different dilution water is approved by the Department prior to use. The primary control water must be specified in the WPDES permit.

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- Chronic tests predict the concentration that interferes with the growth or reproduction of test organisms during a seven-day exposure. To assure that a discharge is not chronically toxic to organisms in the receiving water, WET tests must produce a statistically valid IC<sub>25</sub> (Inhibition Concentration) greater than the instream waste concentration (IWC). The IWC is an estimate of the proportion of effluent to total volume of water (receiving water + effluent). The IWC of 19% shown in the WET Checklist summary below was calculated according to the following equation, as specified in s. NR 106.03(6):

$$\text{IWC (as \%)} = Q_e \div \{(1 - f) Q_e + Q_s\} \times 100$$

Where:

$Q_e$  = annual average flow = 0.07 MGD = 0.108 cfs

$f$  = fraction of the  $Q_e$  withdrawn from the receiving water = 0

$Q_s$  =  $\frac{1}{4}$  of the 7- $Q_{10}$  = 1.8 cfs  $\div$  4 = 0.45 cfs

- Shown below is a tabulation of all available WET data for Outfall 001. Efforts are made to ensure that decisions about WET monitoring and limits are made based on representative data. Data which is not believed to be representative of the discharge is not included in reasonable potential calculations. The table below differentiates between tests used and not used when making WET determinations.

**WET Data History**

Date Test Initiated	Acute Results				Footnotes or Comments
	LC <sub>50</sub> % (% survival in 100% effluent)	<i>C. dubia</i>	Fathead minnow	Pass or Fail? Used in RP?	
12/10/2014	>100	>100	Pass	Yes	
08/10/2016	>100	>100	Pass	Yes	

- WET reasonable potential is determined by multiplying the highest toxicity value that has been measured in the effluent by a safety factor, to predict the likelihood (95% probability) of toxicity occurring in the effluent above the applicable WET limit. The safety factor used in the equation changes based on the number of toxicity detects in the dataset. The fewer detects present, the higher the safety factor, because there is more uncertainty surrounding the predicted value. **WET limits must be given, according to s. NR 106.08(6), Wis. Adm. Code, whenever the applicable Reasonable Potential equation results in a value greater than 1.0.**

According to s. NR 106.08(6)(d), TUA and TUC effluent values are equal to zero whenever toxicity is not detected (i.e. when the LC<sub>50</sub>, IC<sub>25</sub> or IC<sub>50</sub>  $\geq$  100%,).

Acute Reasonable Potential = 0 < 1.0, reasonable potential is not shown, and a limit is not required.

Chronic Reasonable Potential = 0 < 1.0, reasonable potential is not shown, and a limit is not required.

The WET Checklist was developed to help DNR staff make recommendations regarding WET limits, monitoring, and other permit conditions. The Checklist steps the user through a series of questions that evaluate the potential for effluent toxicity. The Checklist indicates whether acute and chronic WET limits are needed, based on requirements specified in s. NR 106.08, Wis. Adm. Code, and recommends monitoring frequencies based on points accumulated during the Checklist analysis. As toxicity potential increases, more points accumulate, and more monitoring is recommended to ensure that toxicity is not occurring. The completed WET Checklist recommendations for this permittee are summarized in the table below. Staff

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recommendations, based on the WET Checklist and best professional judgment, are provided below the summary table. For guidance related to reasonable potential and the WET Checklist, see Chapter 1.3 of the WET Guidance Document: <http://dnr.wi.gov/topic/wastewater/WETguidance.html>.

**WET Checklist Summary**

	<b>Acute</b>	<b>Chronic</b>
<b>AMZ/IWC</b>	Not Applicable. <b>0 Points</b>	IWC = 19 %. <b>0 Points</b>
<b>Historical Data</b>	Tests used to calculate RP = 0. No tests failed. <b>0 Points</b>	No data in past five years <b>5 Points</b>
<b>Effluent Variability</b>	Little variability, no violations <b>0 Points</b>	Same as Acute. <b>0 Points</b>
<b>Receiving Water Classification</b>	Full Fish & Aquatic Life <b>5 Points</b>	Same as Acute. <b>5 Points</b>
<b>Chemical-Specific Data</b>	Limits for no substances based on ATC; ammonia and copper detected. <b>2 Points</b>	Limits for no substances based on CTC; ammonia and copper detected. <b>2 Points</b>
<b>Additives</b>	0 Biocides and 1 Water Quality Conditioners added. SorbX-100 Used: No <b>1 Points</b>	All additives used more than once per 4 days. <b>1 Points</b>
<b>Discharge Category</b>	0 Industrial Contributors. <b>0 Points</b>	Same as Acute. <b>0 Points</b>
<b>Wastewater Treatment</b>	Secondary or Better <b>0 Points</b>	Same as Acute. <b>0 Points</b>
<b>Downstream Impacts</b>	No impacts known <b>0 Points</b>	Same as Acute. <b>0 Points</b>
<b>Total Checklist Points:</b>	<b>8 Points</b>	<b>13 Points</b>
<b>Recommended Monitoring Frequency (from Checklist):</b>	No WET tests recommended	No WET tests recommended
<b>Limit Required?</b>	No	No
<b>TRE Recommended? (from Checklist)</b>	No	No

**PART 7 – EXPRESSION OF LIMITS**

Revisions to chs. NR 106 and 205, Wis. Adm. Code align Wisconsin's water quality-based effluent limitations with 40 CFR 122.45(d), which requires WPDES permits contain the following concentration limits, whenever practicable and necessary to protect water quality:

- Weekly average and monthly average limitations for continuous discharges subject to ch. NR 210.
- Daily maximum and monthly average limitations for all other discharges.



# Attachment #1

Kendall Wastewater Treatment Facility is a municipal treatment facility and is therefore subject to weekly average and monthly average limitations whenever limitations are determined to be necessary.

This evaluation provides additional limitations necessary to comply with the expression of limits in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Code. Pollutants already compliant with these rules or that have an approved impracticability demonstration, are excluded from this evaluation including water-quality based effluent limitations for phosphorus, temperature, and pH, among other parameters. Mass limitations are not subject to the limit expression requirements if concentrations limits are given.

## Method for calculation:

The methods for calculating limitations for continuous discharges subject to ch. NR 210 to conform to 40 CFR 122.45(d) are specified in s. NR 106.07(3), and are as follows:

1. Whenever a daily maximum limitation is determined necessary to protect water quality, a weekly and monthly average limitation shall also be included in the permit and set equal to the daily maximum limit unless a more restrictive limit is already determined necessary to protect water quality.
2. Whenever a weekly average limitation is determined necessary to protect water quality, a monthly average limitation shall also be included in the permit and set equal to the weekly average limit unless a more restrictive limit is already determined necessary to protect water quality.
3. Whenever a monthly average limitation is determined necessary to protect water quality, a weekly average limit shall be calculated using the following procedure and included in the permit unless a more restrictive limit is already determined necessary to protect water quality:

$$\text{Weekly Average Limitation} = (\text{Monthly Average Limitation} \times \text{MF})$$

Where:

MF= Multiplication factor as defined in Table 1

CV= coefficient of variation (CV) as calculated in s. NR 106.07(5m)

CV = Standard deviation/arithmetic mean,

= 0.6 for < 10 data points and for fecal coliform

n= the number of samples per month required in the permit

s. NR 106.07 (3) (e) 4. Table 1 — Multiplication Factor (for CV = 0.6)

CV	n=1	n=2	n=3	n=4	n=8	n=12	n=16	n=20	n=24	n=30
0.6	1.00	1.31	1.51	<b>1.64</b>	1.95	2.12	2.23	2.30	2.36	2.43

Note: This methodology is based on the *Technical Support Document for Water Quality-based Toxics Control* (March 1991). PB91-127415.

## Summary of Additional Limitations:

In conclusion, the following additional limitations are required to comply with ss. NR 106.07 and NR 205.065(7) Expression of Limits.

Parameter	Weekly Geometric Mean	Monthly Geometric Mean	Multiplication Factor (CV)	Assumed Monitoring Frequency (n)
Fecal Coliforms	<b>656#/100mL</b>	400#/100mL	1.64 (CV = 0.6)	n = 4 (Weekly)

### Temperature limits for receiving waters with unidirectional flow

(calculation using default ambient temperature data)

Facility:	Kendall WWTF	Flow	7-Q10:	1.80 cfs	Temp
Outfall(s):	001	Dates:	Start:	06/01/13	Dates:
Date Prepared:	09/19/18		Dilution:	25%	Start:
				0	End:
					12/31/17
Design Flow (Qe):	0.07 MGD	Stream	Cold water community		
Distance to Surface Water:	0 ft	type:			
		Qs:Qe ratio:	4.2 :1		
		Calculation Needed?	YES		

Month	Water Quality Criteria			Receiving Water Flow Rate (Qs) (cfs)	Representative Highest Effluent Flow Rate (Qe)		Representative Highest Effluent Temperature		Calculated Effluent Limit	
	Ta (default) (°F)	Sub-Lethal WQC (°F)	Acute WQC (°F)		7-day Rolling Average (Qesl) (MGD)	Daily Maximum Flow Rate (Qea) (MGD)	Weekly Average (°F)	Daily Maximum (°F)	Weekly Average Effluent Limit (°F)	Daily Maximum Effluent Limit (°F)
JAN	35	47	68	1.80	0.103	0.115	54	54	81	120
FEB	36	47	68	1.80	0.121	0.168	53	54	74	120
MAR	39	51	69	1.80	0.141	0.296	50	51	76	98
APR	47	57	70	1.80	0.128	0.211	50	50	80	102
MAY	56	63	72	1.80	0.159	0.380	51	60	76	84
JUN	62	67	72	1.80	0.162	0.178	61	62	76	88.3
JUL	64	67	73	1.80	0.176	0.331	65	65	72	81
AUG	63	65	73	1.80	0.093	0.118	65	65	71	98
SEP	57	60	72	1.80	0.198	0.393	62	63	64	83
OCT	49	53	70	1.80	0.095	0.123	63	66	65	120
NOV	41	48	69	1.80	0.105	0.139	58	59	67	120
DEC	37	47	69	1.80	0.171	0.380	55	56	64	93

